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ABSTRACT

Although computers are used for administrative purposes and for grading in correspondence course programs throughout the United States, there has been little application to date of computer-assisted instruction (CAI) in these programs. A survey was sent to 899 former students in Indiana University's high school independent study program to determine (1) to what extent various types of hardware are available to students in homes and schools; (2) what percentage have had experience with CAI; (3) how students react to CAI in general and to CAI in independent study courses in particular; and (4) what preferences students might have for implementation of CAI in independent study. Responses on the 81 questionnaires returned (9%) indicate that there would be ample interest in CAI if the computer were used to present material that is difficult to present clearly in paper and print. Students also indicate that they would be interested in CAI only if it did not cause substantial price increases in courses and textbook materials. It was concluded that the most efficient way to implement CAI in a distance learning environment would be to create software on microcomputer disk to supplement material presented in textbooks, workbooks, and learning guides. Due to the changing nature of computer technology, it is recommended that independent study programs experiment with CAI on a small-scale basis, and monitor these courses carefully to obtain information that could be used to facilitate a full-scale CAI effort in the future. The questionnaire is appended. (MES)

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The Results of an Independent Study Program Survey of Current and Former Students on the Role of Computer-Assisted Instruction in Correspondence Courses

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The Results of an Independent Study Program
Survey of Current and Former Students
on the Role of Computer-Assisted Instruction
in Correspondence Courses

In the fall of 1985 Indiana University's Independent Study Program decided to investigate the possibility of incorporating a computer-assisted instruction (CAI) component into some of our courses. From looking at independent study bulletins from other institutions, it was clear that CAI was not widely used in correspondence study programs anywhere in the country. We contacted a number of colleagues at our sister institutions to discuss the situation, and our suspicions were confirmed. CAI is much discussed, but practical considerations have thus far prevented its implementation to any significant degree in independent study.

It is true that a few institutions offer a limited number of independent study courses which contain a CAI component. In conjunction with printed material, students who enroll in these courses learn course material from microcomputer software in the form of purchased or borrowed disks. Students must use the appropriate hardware for which the software was designed in order to proceed through the course. Enrollment has been low in these courses, but it is difficult to lay the blame entirely on hardware availability. Administrators at these institutions have reported very few requests on the part of students to convert the existing software to run on a different brand of microcomputer. Software conversion upon demand would not be a viable option due

to the high costs and technical expertise required, but the lack of requests for this service is curious since one university in question advertised that conversion was available.

In courses offered by a few institutions computer software on disk is made available to students on an optional basis. This is often software which has been developed commercially by the publishers of textbooks which are used in the independent study courses. The computer has the potential to present certain concepts and simulations in a more effective way than can be done with paper and print, but more often than not the commercial software does little else than drill students on the material covered in the text. Since it is possible to provide students with self-tests without using the computer, the majority of students opt not to use it.

Perhaps the most promising of CAI projects currently underway in correspondence programs would be the TeleLearning project. In cooperation with a number of NUCEA member institutions, TeleLearning is involved with the design of a number of independent study courses in which instructional material is presented to students on the computer. Printed learning guides and textbooks will still play a role in the TeleLearning courses, but students will complete written assignments on the computer and receive immediate feedback from instructors who are hooked into the same computer system. Despite its promise, the project is not progressing as quickly as planned. As yet no TeleLearning courses have been opened to enrollment. There are also a number of unresolved problems with

this sort of computer delivery system, such as who will pay fees for the time the instructor is logged on to the system.

Although a number of NUCEA institutions are successfully using computers for grading and for administrative purposes, there seems to be no consensus among member institutions on the role the computer should play in presenting instructional material to students in independent study courses. At Indiana University we are convinced, from having witnessed successful projects in various departments on campus, that CAI can be more effective than traditional media in presenting selected material to students in a variety of subject areas. We therefore felt it would be advantageous in early 1986 to develop a questionnaire which would provide us with useful information on the direction CAI should take in our Independent Study Program. Specifically, we wanted to find out (1) to what extent various types of hardware are available to students in their homes and schools, (2) what percentage of independent study students have had experience with CAI, (3) how students react to computer-assisted instruction in general and to the idea of CAI in independent study courses in particular, and (4) what preferences the students themselves might have for the implementation of CAI in independent study. We decided to concentrate our effort on our high school population, thinking that if our results were successful a similar survey could be sent to college students and noncredit students at a future date.

The Survey Authors

Because of my extensive work with CAI when I was program coordinator in the Indiana University Learning Skills Center between 1979 and 1985, I was given primary responsibility for writing the survey. In the Learning Skills Center I had designed instructional software for the PLATO system on study skills topics such as spelling, memory, and the connection between proper nutrition and one's ability to study. In addition, I had programmed a diagnostic inventory into the computer which helped determine students' weaknesses in various skills areas. In previous research I was able to demonstrate that CAI could aid high risk freshmen to a significant degree when they were learning introductory psychology and introductory sociology material (Hartig, 1984). I also demonstrated that educators could learn a great deal from their students -- even from high risk freshmen -- on the appropriate role of CAI in their courses (Hartig, 1986).

Once I had completed a preliminary draft of our independent study survey, I asked Brent Sweeny of Bloomington Academic Computing Services (BACS) for his input. Mr. Sweeny had become involved with PLATO-CAI as a doctoral student in the English Department at Indiana University, using computer lessons to assist students with their writing skills. After he began to work at BACS, he came to my rescue when I was learning the PLATO programming language. He also provided the Learning Skills Center with considerable guidance in the design and use of CAI in a university setting. Mr. Sweeny is currently Coordinator for

Computer-Based Education at BACS at Indiana University-Bloomington.

After the survey had been modified based upon Mr. Sweeny's suggestions, it was circulated among the professionals in the Independent Study Program. The final version was completed in the spring of 1986, and in May it was ready to be mailed. For those who are interested, the complete survey has been appended to this report.

Survey Participants

A FOCUS program was written by Sheryl Lentz, Senior Records Clerk in the Independent Study Program, which randomly generated the names and addresses of 903 students who had enrolled in one or more of our high school courses during the calendar years 1983, 1984 and 1985. During this three-year period Indiana University recorded 14,154 enrollments in our high school program. The number of names generated consequently represented about .6% of the total enrollment. Of the 903 mailing labels generated, four listed foreign addresses. Since the students were being provided with postage-paid return mail envelopes which were usable only from post offices in the United States, we decided to mail out only 899 surveys. Students were asked to return the survey no later than July 15, 1986.

The survey was sent primarily to residents of Indiana (71%) and Ohio (21%). These percentages should be fairly representative of the overall population our high school program serves, although my perception is that Illinois is somewhat under-represented. The remaining 8% of the participants were

scattered among 22 states and 4 APO regions. Of this 8% the states of Illinois, Maine, Maryland, New York, North Carolina and Pennsylvania were most represented with between six and eight students each. No other single state provided more than four randomly generated students.

Of the 899 surveys which were sent out, 81 were returned. According to Ronald H. Miller, Director of Marketing and Promotion in IU's School of Continuing Studies, a 9% return rate is fairly typical for surveys of this sort. It was nonetheless disappointing that we did not have a larger sample with which to work. Still, the return sample was large enough to provide us with valuable information.

Analyzing the Results

Before considering the results, two underlying thoughts deserve mention. First, it was clear from my previous work with CAI in the Learning Skills Center that, when computer-assisted instruction is optional, it is the more motivated student who will take advantage of it. Use of the computer in the home for educational purposes is usually optional rather than required, and the same statement holds true to a lesser extent for use of CAI in the schools. We can therefore infer that the students with CAI experience who responded to our survey are, as a group, more highly motivated than those with no previous CAI experience.

Second, it is reasonable to assume that when return of a questionnaire is optional it will be the more highly motivated students who will take the time to respond. Since motivation is a factor both with CAI use and with the rate of survey return, we

can assume that a higher percentage of CAI users than nonusers returned the questionnaire. For this reason it seemed prudent to examine the responses of CAI users separately from those of the nonusers.

In considering the comments which follow, it would be wise to keep these assumptions in mind. The answers to several of the survey questions will lend support to these assertions.

Question #1: Have you ever studied a computer-generated lesson?

Computer-assisted instruction (CAI) is a non-universal term. Synonyms include computer-based instruction (CBI), computer-based education (CBE), and computer-based lessons (CBL), to name but a few. In preparing the survey we therefore decided to use the descriptive phrase "computer-generated lesson." We were confident that any student who had used CAI software would understand what was meant. Through the use of the descriptive phrase, we also felt that students who had neither used CAI themselves nor witnessed CAI in use by others could possibly imagine what CAI was.

On the basis of answers to this first question, the surveys were separated into two piles: one for CAI users, one for non-users. Of the 81 responses received, 27 students (33%) indicated that they had used CAI while 54 students (67%) had not used CAI. For the reasons mentioned above, a one-third rate of CAI use is likely higher than one would expect to find in the general high school population. It was my experience at the Indiana University Learning Skills Center, for example, that usually only

between 20% and 25% of a given group of entering IU freshmen had experience with CAI.

Virtually all schools these days have computers for educational use, and nationwide there is on the average one personal computer for every 40 students in public school grades K through 12 in the United States (National Task Force, 1986). It is apparent that a lot of expensive equipment is sitting idle much of the time. There are two major reasons that this situation exists: (a) teachers and administrators often do not know what to do with the equipment, and (b) physical facilities are sometimes not sufficient to provide computer work stations for students in adequate numbers.

Of the 27 CAI users, 89% claimed to have used CAI in school. Two students (7%) had used CAI both in school and at home. The remaining CAI user had not used CAI in high school, but since graduation he had used it in a college class. When these figures are considered in conjunction with question #3 below, it is apparent that home computers are being used largely for purposes other than the presentation of educational material.

In rating their experiences on a continuum, the 27 CAI users in general responded favorably to their CAI experience:

Favorable				Unfavorable
1	2	3	4	5
33%	33%	22%	7%	4%

Challenging				Easy
1	2	3	4	5
33%	37%	15%	11%	4%

Frustrating				Comfortable
1	2	3	4	5
11%	19%	30%	11%	30%

Would recommend to friends				Would not recommend to friends
1	2	3	4	5
44%	15%	26%	11%	4%

Two-thirds of these students said their experience had been favorable, 70% indicated that CAI was challenging, and 59% said they would recommend CAI to their friends. Only 41% felt their experience had been comfortable, but an additional 30% responded in a neutral way to this question, i.e., that their experience with CAI was neither comfortable nor frustrating.

Although the response is generally favorable, it is important to note the following:

-- 11% of the CAI users rated their experience on the unfavorable end of the continuum

-- 30% said their experience with CAI had been frustrating

-- 16% would not recommend CAI to their friends, and another 26% were unsure whether they would recommend CAI or not.

These figures are high enough to be disturbing, but they should not be surprising to educators who have experience with CAI. Over the past 7 years I have previewed a considerable amount of educational software. This software of course includes lessons on the PLATO system, but it also includes commercial software delivered on floppy disk for use on various Apple, IBM, Radio Shack, Texas Instruments, Commodore and Atari microcomputers. Each year I expect to see improved quality, but each year I determine that a large percentage of commercial software is flawed. If it is pedagogically accurate, the computer programs may still contain bugs which prevent them from being used as prescribed. Even when the content is sound and the lessons are properly programmed, commercial software can be presented in a lackluster or even boring way. And if it is pedagogically sound and not boring, it may still not be ideally suited for a particular educational situation because it may not jive completely with the textbook and lecture materials which comprise the bulk of the instruction (Akst, 1984). The director of an instructional media center in the Boston area perhaps summed up the software dilemma best when he stated: "Let's face it, teachers were not meant to be computer programmers, nor were programmers born to teach" (Foulcalt, 1986). Until the two groups can work together to provide tailor-made software for a particular educational venture, software quality in general will remain poor.

With regard to the subject areas in which students had used CAI, over half were in computer courses or closely related fields:

subject	number of responses
computer science/ programming/ literacy	14
introduction to word processing	5

It comes as no surprise that instructional material on computer use would be presented on the computer. It was surprising to me, however, to learn that CAI in the high schools is not more widespread in other academic subjects. Three students had used CAI in English language courses, and another three in basic math courses. Otherwise, no subject was mentioned on more than one survey, although a wide variety of subjects received isolated mention: Accounting, Pre-Med Sciences, Latin, Health and Safety, Spanish, Typing, Calculus, Biology, General Science, Personal Finance and Music Theory.

The part of question 1 which asked when students had used CAI did not yield much useful information because it was interpreted differently by different people. Some students provided dates or years (mostly the fall of 1985 or the spring of 1986, but one student had used CAI as early as 1976). Other students answered that they had used CAI "after school" or "in grade school." Forty-four percent of the respondents did say, however, that they had used CAI in high school classes.

Question #2: In what subject areas do you feel computer-assisted instruction would be most useful? Least useful?

The purpose of this question was not so much to develop a list of subject areas as it was to determine if the students really knew what CAI was.

Of the 27 CAI users who responded to the survey, it is reasonably certain from their comments that 26 had actually used CAI, i.e., instructional material in any particular subject area which is presented to the students by means of the computer. The remaining student had definitely used computers for word processing, but it is unclear whether he/she in the process actually worked with CAI. I suspect this was not the case because the subject areas identified in which CAI would be most useful were "homework and exams." Least useful in his/her opinion was "reading." But this student does state that textbooks should not be eliminated in any subject but instead should be used in conjunction with CAI, so my suspicion my be false.

The 54 responses from students who had not used CAI showed some definite misconceptions on the part of a few students on the nature of CAI. One student commented, for example, that CAI should not be used in math courses because "you can't learn if the computer does all of the computing for you." A number of other students seemed to have only a vague idea of CAI, expressing the opinion that the computer can produce magical results. On six or seven surveys, for instance, were statements such as these:

-- Math is hard. The computer will help students understand. It can make it a lot easier.

-- If you could afford a computer it would be good for all subjects.

-- Computers are good for all subjects of memory.

My best guess from reviewing the surveys would be that 85% or more of the nonusers had a pretty good grasp of what CAI was, even though they had not used it themselves. In many cases they no doubt had talked with classmates or teachers who had experience with CAI, or they had heard about CAI and how it is used through the popular media.

It is interesting that both the users and nonusers agreed fairly closely on certain subjects in which CAI would be most useful: mathematics; various sciences (chemistry, biology, physics, psychology); business; and languages (including English). Both users and nonusers noted that in these fields there are formulas which can be displayed step-by-step on a computer terminal, that computers are good for simulations and other problem-solving activities, and that problems in these fields can have discrete answers which the computer can judge immediately as correct or incorrect. Several students pointed out that they had already seen a number of excellent computer simulations in these subject areas.

CAI users, however, were much more inclined than nonusers to see a role for the computer in the presentation of material in the humanities and social sciences. A half dozen CAI users felt, for example, that CAI would be quite useful in history and other social studies courses, but no nonusers mentioned this field.

In fact, history and social studies were listed by nonusers on 15 surveys as the least useful fields for CAI. None of the CAI users listed these subjects as least useful, though. Instead they tended to list music and art as the least useful fields. Music and art coincidently were not mentioned at all by nonusers. About the only "least useful" subject on which CAI users and nonusers were in complete agreement was literature.

Question #3: Do you have a microcomputer in your home?

This question yielded a surprising result: almost as many nonusers (28%) as CAI users (33%) have computers in their homes. Some of this computing equipment no doubt is being used for games and word processing. (The results of question #1 would indicate it is certainly not being used for the presentation of educational materials.) However, there is ample evidence to support the claim that many home computers are not being used at all. Several of my colleagues have reported this: they or their relatives have purchased computers for their children, but the children have shown little interest in using them. So besides idle equipment in the schools, educators must also contend with idle equipment in the homes.

Of the nine CAI users with home computers, three owned IBM-PC's with memory capacity between 128K and 640K. Three owned Commodores with 64K memory, and one person each owned an Apple IIe and a Texas Instruments 99. One person did not specify the brand of the computer he or she owned. With the exception of one Commodore owner, all nine students had mass storage capability on disk. Two students had used both disk and tapes.

Neither the Apple IIe owner nor any of the three Commodore owners owned a printer.

Of the 15 respondents who owned computers but had not used CAI, three individuals owned two computers each. In this group five persons owned Commodores (four model 64's and one C128). Five owned Apples (three IIe's, one 2-plus and one McIntosh) with memory capability ranging from 64K to 512K. Four owned the IBM-PC or PC-junior with memory ranging from 240K to 256K. Two owned Radio Shack computers with 16K memory. One person each owned a TRS80 with 128K memory and a Visual microcomputer with 256K memory. With the exception of the Radio Shack computer owners and the owner of the Commodore C128, all of the nonusers who owned computers also owned a printer.

Perhaps the most interesting point revealed by the responses to this question is that, both among CAI users and nonusers, most of the home computers were <u>not</u> recent acquisitions. Only one CAI user and three nonusers had purchased the computer within the last two years. The great majority of the computers had been purchased in a three-year period betweeen 1981 and 1984.

The diversity among microcomputers currently in use on the home market makes wide scale use of CAI software in independent study programs problematic. The main reason this is true is that there is as yet no standardization in the industry, both with regard to the language the machines will understand and the size disks which can be used. As my concluding remarks would indicate, though, I do not think this problem is insurmountable.

Question #4: If you don't already have one, are you or your family considering the purchase of a microcomputer for use at home?

Of the 27 students who had experience with CAI, five of the nine who already owned a computer were considering the purchase of a second home computer:

-- one wanted to purchase a Tandy Radio Shack 80 with 128K memory, double disk drive, with a TRS 80 DWP-410 printer
-- one planned to purchase (by the end of June 1986) a Zenith Z100 with dual disk drive and an Okidata printer
-- three were interested in the Apple IIe (although one of these was still also considering the IBM-PC junior)

Thirteen of the 27 students who had experience with CAI, or just under half, said they did not own a computer and had no intention of buying one in the foreseeable future.

By contrast, 30 of the 54 non-users (slightly over 50%) did not own a computer and did not plan to buy one. Only nine of the nonusers of CAI who did not already own a computer intended to buy one. Two were thinking of the IBM-PC, one of an Atari model, and one of the Zenith Z100. Five of the nine had no particular brand in mind. None of these nine were able to provide specifics on desired memory capability, and only two indicated they would also be purchasing a printer.

Question #5: Have you ever connected a terminal or a microcomputer in your home to a large computer via dial-up telephone modem?

Of the 27 CAI users responding to the survey, six (22%) had experience with modem hook-ups. Only four were able to specify the microcomputers in the home which were used. These included the IBM-PC, the Commodore, and the TRS-80. Only three of the six provided information on the location of mainframe to which they were connected: two were in local colleges and one was at an IBM facility.

A much lower percentage of the respondents who had not used CAI (13%) had experience with modem hook-ups. Of the seven students with modem experience, six did not provide specific information on the microcomputer or terminal used in the home. (The only student who provided this information had used a Radio Shack model.) Two of the seven hooked into a mainframe at a local school, while two others indicated they had hooked into a commercial home subscriber service (i.e., CompuServe).

Question #6: Are you currently a home subscriber to a commercial computerized information service?

Of the 27 CAI users who responded to the survey, three (11%) said that they were currently subscribing to such services. One subscribed to CompuServe and one to People Link. The third respondent did not specify the company.

Of the 54 respondents who had not used CAI, only two (4%) are currently subscribers to computerized information networks. One subscribes to CompuServe; the other did not specify the

company. In a couple of instances students indicated that they previously had subscribed to CompuServe, but had discontinued the subscription because of the costs involved.

There are a number of commercial databases available to the general public, including the following: BRS/Educator, CompuServe, Dow Jones News Service, Knowledge Index, and the Source. Educational institutions at present are the largest users of such services -- for reference information and for use as bulletin boards. The regions served by these companies is expanding. CompuServe, for example, is now available in over 500 cities nationwide.

Besides the cost of a local phone call, there is an access charge which subscribers must pay. With CompuServe the access charge is currently 20 cents per minute during the day and 10 cents per minute at night (Birkhead, 1986b). At 1/2-hour per day, which is the minimum recommended amount of time in a number of Indiana University's independent study courses, users could easily run up a monthly bill of $180.00 or more just to do their coursework if the entire course were presented through this medium. This is over and above what it would cost for the initial investment into the modem and terminal/microcomputer. From the financial perspective, therefore, it would appear that use of these services to deliver independent study course material would appeal only to a select few independent study users.

Questions #7: Do you have access to a microcomputer for educational purposes in your school?

Of all 81 respondents, 53% said they had access to a microcomputer in their high schools for educational pursuits. Of the 27 CAI users who responded, the percentage was very high: 75%. Of the 54 nonusers who responded, though, only 43% said they had access to microcomputers in their schools. An additional 9% of the nonusers said they did not know whether or not their schools had this equipment.

In light of the claims cited earlier that virtually all schools own microcomputers these days, it is surprising that so many of our respondents would claim otherwise. As previously mentioned, the large majority of these surveys (71%) were completed by students who attend or used to attend high schools in the state of Indiana. According to a recent report, there are 302 school districts in the state of Indiana. These school districts collectively own 22,593 microcomputers which are designated for educational use, the computing resources being concentrated at the high school level (Olds, 1985). The top ten brand names in Indiana schools are listed here in descending order:

Apple	11,335
TRS-80	3,759
Commodore 64	2,353
Commodore PET	1,716
IBM	1,671
Atari	483
Texas Instruments	382
Franklin	330
TRS Color Computer	204
Digital	83

An additional 609 units manufactured by other companies are also currently in use (Olds, 1985). In virtually all cases the schools have printing capability to go along with the computers.

By all accounts, the amount of computer hardware in schools, both in Indiana and elsewhere, is constantly increasing and will continue to do so in the foreseeable future. From these facts we can infer two things: (1) that as stated before a large amount of the computing equipment in the schools is sitting idle, and (2) that in many instances computing equipment is available to students, but the students have not become informed about these opportunities.

Of the 74% of CAI users in our survey who claimed to have access to microcomputers, most knew the brand names but little else about the computers:

Apple IIe	9
IBM-PC	5
TRS-80	3
Zenith	3
Commodore 64	2
Atari	1
Franklin	1

The above figures reflect the fact that many schools have several different brand names in use. Four students said their schools did have microcomputers for student use, but they did not know which brands.

In looking at the responses from the 54 students who had no CAI experience, the brand names listed were very similar to the above:

Apple IIE (or McIntosh)	11
IBM-PC	5
Commodore 64	2
TRS 80	1
Rainbow	1

Nine students in this group claimed to have access to microcomputers in their schools, but they were unable to provide the brand names.

Question #8: Do you have access for educational purposes to a large computer in your school?

As one might expect, neither CAI users nor nonusers knew much about mainframes in their schools. Of the 27 CAI users who

responded to our survey, 37% indicated that their schools did have a mainframe which could be used by students (one made by IBM and one DEC, the rest unspecified). Of the 54 nonusers who responded, only 19% said their schools had such equipment (one VAX and one IBM, the rest unspecified).

Question #9: If you have no computer in your home or in your school to use for educational purposes, what would you do if you wished to enroll in an independent study course which required work on a computer (no printer required) as a portion of each lesson?

The first choice of a plurality of CAI users and nonusers alike would be to find a computer to use for the course. Users were somewhat more likely than nonusers to choose this response. Only one CAI user indicated he/she would not enroll in the course in such circumstances, but 20% of nonusers said they would not enroll.

The following chart indicates the percentage making each response:

	CAI users n = 27	CAI nonusers n = 54	overall n = 81
Find a computer to use (at a friend's house, at school, at a church, etc.)	44%	33%	37%
Rent a computer for use in the course	7%	7%	7%
Purchase a computer for the course and as an investment for the future	22%	15%	17%
Decide not to enroll	4%	20%	15%
Either find a computer or purchase one	4%	--	1%
No response	19%	24%	22%

Several students commented that public libraries often have microcomputers which are available for student use, and that any student who wanted to find a computer would have little trouble doing so. Of the students who would choose not to enroll, the most common comment was that it would be too much of a hassle to try to find the right equipment.

Question #10: Which one of the following statements most clearly reflects your opinion?

The following chart shows the percentages making each response:

	CAI users n = 27	CAI nonusers n = 54	overall n = 81
Independent Study courses should be entirely computerized (all reading material, written assignments and exams completed on the computer)	15%	4%	7%
Independent Study courses should use the computer to present reading assignments (instead of textbooks and printed study guide), but exams and written assignments should be completed with paper and pencil in the traditional manner	7%	7%	7%
Independent Study courses should continue to rely exclusively on textbooks and a printed study guide for presentation of course materials, but students should complete written assignments and exams on the computer	4%	9%	7%
Independent Study courses should rely heavily on printed textbooks and study guides, but interactive drills, simulations and/or problem-solving experiences should be provided in a computer "lesson"	33%	17%	22%
Independent Study courses should use computer lessons on an optional basis only, and additional textbook or study guide assignments can be given to students who do not wish to use the computer	33%	30%	31%

Independent Study courses should not rely on computer lessons, but appropriate computer lessons should be made available to interested students for purposes of enrichment (for a small additional charge)	4%	22%	16%
Independent Study courses should not use computer-assisted instruction	--	6%	4%
Have two versions of each course, one without the computer and one with	--	2%	1%
Computer use should be optional, but if a student chooses it he/she should be required to turn in written assignments on the computer in addition to using a textbook	4%	--	1%
No reply	--	4%	2%

In looking at these responses it is interesting to note that a clear majority of CAI users (61%) favors some sort of mandatory CAI use in certain independent study situations, while just as many nonusers (60%) feel that CAI in independent study courses should at best be optional. CAI users were much more likely than nonusers (33% versus 17%) to say that CAI should be used in independent study to present educational material which cannot adequately be presented in paper and print format: simulations, interactive drills and problem solving exercises.

The most popular single response overall was that CAI should be used only on an optional basis in independent study courses. Even among CAI users this choice received as many votes as any other single choice. It would therefore be interesting to query

institutions where CAI in independent study courses is currently available on an optional basis to get exact figures on how many students are using the software and also on how helpful the students feel the software has been.

One student, a CAI user, made an interesting comment concerning the question of mandatory versus optional use of CAI:

> Do you realize that students' aptitude for computer related study can affect their performance in the class? Whether good or bad, perhaps an evaluation of related performance rather than interest ought to be taken into account.

This comment reminded me of an article I had used in previous research concerning the effects of student personality on CAI success (Hoffman and Waters, 1982). On the basis of this article, my own experience in the Learning Skills Center, and the investigation of programs in which students using CAI had demonstrated more success than nonusers when objective performance criteria were considered, I argued that use of CAI as we know it today should be voluntary.

If and when computers replace books as as the primary means of disseminating information in education, the argument about personality will lose much of its validity. There are many people today, some diagnosed as dyslexic, who have considerable trouble with the paper and print medium. While programs to aid these students sometimes provide alternatives to print (such as audiotapes), they also traditionally concentrate on helping these

people cope with their disabilities. In a futuristic society with everything computerized there will no doubt be similar programs for people who have true disabilities with regard to computers.

Question #11: If you feel computer-assisted instruction has a place in independent study courses, which configuration would you prefer? Please rank.

Interpretation of the responses to this question was difficult because a number of students did not rank the choices from 1 to 5, but instead ranked several options with the same number. For example, one student ranked all five choices as "3", presumably to indicate that in his opinion no choice seemed better or worse than any other. One CAI user and 17 nonusers did not respond at all to this question.

The percentages on the following chart are based upon the responses of those students who completed this question as it was intended:

Options:

A. Students use computer terminals (at specified locations within the IU system) which are connected to centralized large computers.

B. Students use terminals in schools or homes with access via telephone modem to lessons located on a centralized large computer.

C. Students use terminals in schools or homes, but dial up the large computer only long enough to download instructional materials into their microcomputers.

D. Computer lessons are provided to students on disks for use in a microcomputer in homes or schools.

E. Students subscribe to a commercial computerized information service and use terminals in their homes to work through independent study courses.

Ranking: 1 = most preferred

5 = least preferred

	CAI users n = 18					CAI nonusers n = 31				
Option	1	2	3	4	5	1	2	3	4	5
A	17%	11%	11%	11%	50%	13%	10%	10%	13%	53%
B	0%	39%	17%	39%	6%	3%	17%	60%	17%	3%
C	11%	11%	44%	6%	28%	7%	47%	17%	27%	3%
D	72%	6%	17%	6%	0%	70%	13%	3%	10%	3%
E	0%	33%	17%	33%	17%	0%	20%	10%	33%	37%

It is interesting to note that, in this case, there is considerable agreement between the responses of CAI users and nonusers. In both groups, over 70% of the respondents feel the best choice would be loaning or selling the CAI software to students on disk. The students obviously are attracted to the flexibility this allows. Also, 50% or more of the respondents in both the user group and nonuser group feel the worst choice would be to require students to use IU system computer terminals with software being run on an IU mainframe. A common comment was that it would be inconvenient for students to use an IU system terminal if they lived any distance at all from an IU campus.

If we look at rankings 1 and 2 combined as positive, and at rankings 4 and 5 combined as negative, another area of agreement is apparent. Although CAI users seem more willing than nonusers, more than half of the respondents in each group would not look favorably on the use of commercial computerized information services to deliver independent study course material.

The differences between the user and nonuser responses deserve mention at this point, although they are not as numerous as the similarities. Almost twice as many CAI users (39%) as nonusers (20%) seem willing to work from their homes with a modem connected to a mainframe unit. For their part, the majority of nonusers (60%) were neutral to this idea. Nonusers tend to look more favorably than CAI users on downloading instructional material via dial-up modem into microcomputers in their homes. Most CAI users (44%) seemed neutral to this idea.

Question #12: In your opinion, how do independent study courses compare with classes taught in your school?

This question was added to the survey at the last minute because space was available for an additional question. The results seem valuable because they help confirm previous inferences about motivation. Of all 81 students who participated in the survey, the clear majority liked the independent study format for learning. CAI users, however, gave independent study consistently higher marks than nonusers:

	Effective				Ineffective
	1	2	3	4	5
Nonusers	20%	39%	17%	11%	2%
Users	44%	33%	19%	4%	0%

	Challenging				Easy
	1	2	3	4	5
Nonuser	30%	33%	17%	7%	0%
Users	37%	37%	11%	11%	4%

	High Quality				Low Quality
	1	2	3	4	5
Nonusers	20%	31%	30%	6%	0%
Users	41%	33%	15%	11%	0%

The favorable responses from several nonusers to the challenging/easy issue was qualified with the statement, "It was too challenging."

In general we in independent study programs tend to believe that the more motivated students can fare better in independent study courses. Since the assumption is that the more motivated students also choose to use CAI and to return questionnaires of this sort, it should be no surprise that the responses of CAI users to this question was more positive than those of nonusers.

Question #13: Personal Data

Part A: In which Independent Study course(s) did you enroll?

Part B: Did you complete the course(s)?

Part C: In what month and year did you enroll?

As mentioned earlier, the 900 students chosen at random to receive the survey had enrolled in 1983, 1984 or 1985. The 81 students who responded to the survey had enrolled collectively in 108 courses. (The 27 CAI users enrolled in 38 courses collectively, the 54 nonusers in 70 courses.) Over 50 different courses were represented in the sample in virtually every high school department. The most heavily represented courses, as one would expect, were the courses with our heaviest enrollment: First Semester Government, Economics, Health and Safety, and various math courses.

As further evidence that the students responding to the survey were highly motivated, we can look at the course completion rates they reported. It is generally accepted by NUCEA independent study member institutions that students will send in the first lesson in a course just 50% of the time, and that less than 60% of those who send in the first lesson will actually complete the course. So with the 108 enrollments

represented by our survey, we could expect students to send in the first lesson in 54 courses. In 32 instances (i.e., in less than 30% of the courses) we would expect to eventually issue a transcript for a completed course.

In looking at the student responses in this survey, it is interesting to note that 59% of the 108 courses have already been completed and that the students expect to yet complete an additional 24% of the courses. If all courses are completed as planned, the completion rate of the students participating in our survey would be a whopping 83%.

The course completion rate, as one might expect based on the motivational factors, is somewhat higher for the CAI users than for the nonusers. Of the users, 71% of the courses had already been completed and in an additional 18% completion was expected. Of the nonusers 53% of the courses had already been completed and 27% are slated for future completion. In both groups, however, the completion rate is much higher than usual.

Part D: State of residence when enrolled.

Part E: Population of city/town in which you lived when enrolled.

Part F: Which one of the following best describes your living situation at the time you were enrolled in Independent Study: urban, suburban, small town, rural?

Consistent with the figures provided earlier concerning the states to which the surveys were mailed, 69% of the students

lived in Indiana at the time of their enrollment and 20% lived in Ohio. Students from other states were somewhat more inclined to return the survey, but the difference in the return rate is not significant.

The following chart shows the populations of the towns and cities served:

	CAI users n = 27	CAI nonusers n = 54	overall n = 81
Under 1000	4%	9%	7%
1000 - 5000	19%	20%	20%
5000 - 10,000	15%	17%	16%
10,000 - 25,000	37%	19%	25%
25,000 - 50,000	7%	15%	12%
50,000 - 100,000	0%	9%	6%
100,000 - 500,000	7%	7%	7%
over 500,000	4%	0%	1%
No response	7%	4%	5%

Population aside, here are the students' perception of their own living situations:

	CAI users n = 27	CAI nonusers n = 54	overall n = 84
Urban	0%	6%	4%
Suburban	26%	19%	21%
Small town	48%	41%	43%
Rural	26%	28%	27%
Incarcerated	0%	2%	1%
No response	0%	6%	4%

Very few of our students come from larger communities. There does not seem to be any appreciable difference between the data provided by CAI users as opposed to nonusers.

Part G: Why did you enroll in Independent Study?

In this question students were encouraged to check as many categories as applied, and also to provide other reasons if applicable. CAI users were more likely than nonusers to provide multiple answers. Of 53 nonusers who answered this question there were 62 reasons given for having enrolled in Independent Study courses; of 27 CAI users who responded 37 reasons were given.

For the purposes of comparison between the unequal groups of users and nonusers, I have converted the responses to percentages. The percentages are based upon the total number of reasons given for each the CAI user group and the group of nonusers:

	CAI users	CAI nonusers	Overall
	n = 37	n = 62	n = 99
Course not offered in my my school	11%	3%	6%
Scheduling conlfict at school	24%	23%	23%
To qualify for early graduation	16%	15%	15%
To make up a course failed in school	16%	19%	18%
Illness or pregnancy	8%	8%	8%
General interest	14%	6%	9%
Needed credits to graduate	8%	11%	10%
To improve grades in courses already taken in high school	0%	3%	2%
To qualify for athletics	0%	2%	1%
My class at school voted on a foreign language course to take together	0%	2%	1%
Incarceration	0%	2%	1%
Lowest cost option	0%	2%	1%
I wanted study hall in my school schedule next year	3%	2%	2%
To make up deficiencies for a course I wanted to take at school	0%	2%	1%
Personality conflicts at school	0%	2%	1%

The most common reason given for enrolling in independent study was a scheduling conflict at school, followed closely by making up a class that had been failed. This is true among both users and nonusers.

About the only difference between the users and nonusers which seems worthy of mention is the response "needed credits to graduate." Two of the three CAI users who wrote in this reason indicated they had been exchange students overseas and were trying to graduate with their classes now that they had returned to the USA. For their part, several nonusers who wrote in this reason indicated they were adults who were trying to earn a high school diploma.

Part H: Your current age:

From responses to this question and Part C above I was able to determine that 83% of nonusers and 81% of the CAI users were of high school age (ages 14-18) at the time they enrolled in the independent study courses. Only one student, a CAI user, was younger than this: he was eleven years old at the time he enrolled. Only five students were over the age of 25, one a CAI user and the rest not.

RECOMMENDATIONS

Even though the survey population was relatively small, it is possible to draw a number of conclusions based upon the responses we received. First, the number of students having used CAI is small, so any CAI effort in an independent study program must be carefully implemented. For first time users we need to

provide basic step-by-step instructions on how to use the software, beginning with turning on the electrical power to the hardware. To avoid frustration on the part of students, we must assure that the software we provide has been totally debugged and that it is compatible with the student's hardware. We must also be sure that the instructional material delivered via CAI is correct, and that it takes advantage of the capabilities the computer offers over traditional media. To accomplish this, we almost assuredly will have to develop and program the CAI lessons ourselves rather than trying to use commercial software.

Only a small percentage of homes contain computer hardware, but most students have access to microcomputers in their schools. If students do not have access to them at home or in school, there is every indication that the great majority of students would find a computer to use if they wanted to enroll in a course with a CAI component. Many libraries these days have microcomputers which are available to the general public. Students could also find computers to use at their churches or friends' houses.

If CAI is used in independent study courses, most students would seem to prefer the use of microcomputer software on disk over any other CAI delivery mode. This is probably the least complicated arrangement for the Independent Study Program for a number of reasons: (1) After the initial development costs there will be no ongoing charges for use of computer space in a mainframe unit, (2) Independent Study need not be concerned on an ongoing basis with either the adequate availability of terminals for student use or the availability of dial-up access,

(3) Independent Study will not need to fund consultants to assist students who are experiencing difficulty with mainframe terminals or dial-up hookups, (4) there will be no concern that a commercial computer information service might not deliver the product as agreed on an ongoing basis, and (5) it will not be necessary to provide independent study instructors with regular access to computer hardware. The last point would be particularly problematic if we wanted to try delivery of CAI on-line since our instructors are scattered all over the state.

The main problem to contend with if software is provided to students on disk would seem to be the wide variety of equipment which is out there. If independent study courses with a CAI component are to be viable for a large number of students, we would have to develop several software packages simultaneously, each of which is designed to run on a different brand of hardware. At the very least it would seem necessary to provide software options for the Apple, IBM-PC and Commodore models. A large number of these computers yet today have as little as 64K memory, so the software we develop would ideally require at most 64K memory.

With regard to the IBM-PC and Apple situation, a simple solution seems to present itself in the form of an authoring system called TenCore. TenCore has been used for the past 1 1/2 years at the IU Learning Skills Center to develop instructional software for the IBM-PC. Students need only 64K memory to use many programs developed with TenCore, although the programmers will need additional memory to develop the CAI lessons.

The regular TenCore price charged to educational institutions is $1600. For another $1600 we could purchase a conversion program which would automatically reformat IBM-PC software programmed with TenCore so that it can be used on Apple microcomputers. If enough interest is shown on the Indiana University-Bloomington campus by the early part of 1987, BACS may be able to arrange a quantity discount by which we could obtain one or both of the above for $1000 each.

By using TenCore in this manner, we would greatly reduce the programming effort needed to supply software for the IBM and Apple machines. We would still need to program separate packages for the Commodore, and the Commodore software may not be equal to the IBM/Apple software due to the more limited display capabilities of the Commodore hardware.

The time is not right for a full-scale plunge into CAI independent study. There are too many unknowns with regard to the future of much of the current hardware, and machines which are available today may be obsolete tomorrow. Software technology is also constantly changing. For example, companies are beginning to apply compact laser disk technology to the problem of microcomputer data storage. A 5" disk has the potential to store up to 270,000 typewritten pages, which is as much material as 1500 of today's floppy disks can hold. "CD's have a strong future in the delivery of bibliographies, full-text and numeric databases, and educational computer software programs" (Birkhead, 1986).

Another reason to be hesitant about CAI in distance learning is that software standardization seems inevitable at some point

in the not-too-distant future. Indications are, for instance, that IBM-PC compatibility will increase in the next few years. There is ample precedent in the history of technology for such an expectation. Phonograph records, cassette tapes, videotapes, and now audio compact disks have been standardized in format and size so that different companies around the world can produce software with mass appeal. If commercial software is to stabilize at an acceptable level of quality, such standardization is a prerequisite.

Even though it is premature to proceed with full-scale application of CAI in Independent Study courses, it is not too early in 1987 for the Independent Study Program to experiment with CAI on a limited basis. Such an effort would let us know how students respond to CAI software so that we will be in a better situation to judge its merits and disadvantages. An experiment at this time will also enable us to better plan for proper implementation once we can gain a better understanding of the future direction the technology will take.

Outside funding is currently comparatively easy to obtain for projects which investigate computer applications. I would suggest, once we have a project defined, that we prepare grant proposals for funding both from sources within the university and from one or more major computer companies outside the university. We might ask for a small grant in the neighborhood of $1000 or $1500 from Indiana University's Office of Learning Resources in Bryan Hall, and for grants from the Apple, Commodore and IBM companies for hardware acquisition. Additional grant money and

money from regular Independent Study Program sources would need to cover (1) the involvement of a BACS expert to oversee the project from the technical perspective, (2) time spent on the part of the course author/instructor for input on the software development from a pedagogical perspective, and (3) the wages paid to the computer specialist(s) who design and program the software. For our part, Independent Study staff can provide expertise in the problems unique to distance learning and guinea pigs to try out the software as a part of the debugging process.

Based upon the responses of students to this questionnaire and my own experience with CAI in the Learning Skill Center, it seems imperative if this experiment is to be successful that we choose a subject area for the pilot project which can truly benefit from the computer's capabilities. In other words, we do not want to use the computer for purposes which are just as easily served by the paper and print medium. It is perhaps a fortunate coincidence that IU's high school science courses are scheduled to be revised to new textbooks in 1987. Computer simulations would seem particularly appropriate in Aeronautics, Earth Science, Biology and Chemistry because many of the concepts are difficult to present clearly in textbooks.

There are also advantages to the presentation of educational materials in these fields via CAI as opposed to videotapes or television. Simulations can be designed so that student input throughout the program will affect the direction the simulation will take and its ultimate outcome. By including CAI as only one component in a dual- or multi-media approach, we also can prevent

the boredom on the part of students which may result from the same old routine day in and day out.

The following chart shows the science courses we could choose from in a pilot CAI project:

	Course	Average annual enrollment
01A	Principles of Flight/ Space Travel	36 students
11E	Introductory Earth/Space Science: First Semester	51
12E	Introductory Earth/Space Science: Second Semester	23
21B	Biology Level I: First Semester	46
22B	Biology Level I: Second Semester	35
21H	Plant Science: First Semester	22
22H	Plant Science: Second Semester	6
21P	Physical Science: An Introduction to Chemistry	24
22P	Physical Science: An Introduction to Physics	11
41P	Physics Level I: First Semester	14
42P	Physics Level I: Second Semester	5

It would be to our advantage to use high enrollment courses as our CAI experimental courses, so that our data base for future study is as large is possible. Based upon this desire and upon my knowledge of the subject matter involved, I would suggest 01A, 11E and 21B/22B as possibilities in that order.

At this point I would recommend for practical reasons that written assignments and exams in our experimental courses be completed either with paper and pencil in the traditional method,

or that they be completed on disk but printed out for the instructors. Since students will be using software on disk rather than via direct hookup to a central computer system, there would be no time savings on getting instructor feedback to students if students sent in their work on disk. If students did their work on disks, we would need to provide each instructor with access to each kind of hardware our students might be using. On an experimental basis this might be feasible, but as our use of CAI expands it would mean providing hardware not only to our instructors who live in Bloomington but also to those in Highland, South Bend, Indianapolis, Columbus, Ellettsville, and other locations around the state. Even though the written assignments will continue to be submitted on paper, students could answer additional questions in the traditional format which describe the results of any simulation they complete. They could also be asked to evaluate each CAI component of the course for effectiveness. In this way the CAI material can be fully incorporated into the larger overall learning objective. This type of media integration has been identified as a requisite for success in any CAI program (Camstra, et al., 1979).

It may be interesting to keep the old version of the experimental course open for a year or so (if textbooks are available). We could thereby give students the choice of enrolling in the course requiring CAI or in the traditional independent study course. In this way we could assess the relative popularity of CAI in the independent study format. We would also not lose any enrollments for at least a year on the part of students who, as indicated in Question #9 on the survey,

would choose not to enroll rather than "hassle with" CAI. After a year we could cut off the old course, and in the ensuing year monitor enrollment to see if we notice a significant decrease in enrollment due to the CAI requirement. To keep the CAI courses' costs competitive with the non-CAI counterparts, I would recommend that we loan disks to students as per our current audiotape system rather than require students to purchase the software.

In closing I will point out that a number of students made additional comments at various spots when completing the survey. There is a lot of interest among the population we serve in applying computer technology. One student summed up this interest by writing:

> I just wanted to say that if you do [implement CAI in correspondence courses, you need to] use computer software that is convenient for everyone taking that particular course. And that I really hope you do use it!

It is time to experiment with CAI in independent study courses at IU, but we must proceed carefully.

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QUESTIONNAIRE FOR CURRENT AND FORMER INDEPENDENT STUDY HIGH SCHOOL STUDENTS ON COMPUTER-ASSISTED INSTRUCTION

1. Have you ever studied a computer-generated lesson?

no _____ (if no, go to next question)

yes, in school _____

yes, at home _____

specify subject area(s) _____

when did you use the computer lesson? _____

Please rate your experience on the following scale (circle the most appropriate number):

favorable				unfavorable
1	2	3	4	5
challenging				easy
1	2	3	4	5
frustrating				comfortable
1	2	3	4	5
would recommend to friends				would not recommend
1	2	3	4	5

Comments: _____

_____

2. In which subject areas do you feel computer-assisted instruction

would be most useful? _____

Least useful? _____

Explain your answer: _____

_____

_____

_____

-continued on reverse side-

3. Do you have a microcomputer in your home?

_____ no

_____ yes, specify brand/model _____

RAM memory capacity in kilobytes _____

mass storage device (disk, tape or both) _____

if printer, specify brand/model _____

date of acquisition _____

4. If you don't already have one, are you or your family considering the purchase of a microcomputer for use at home?

_____ no

_____ yes, specify brand/model _____

expected memory capacity _____

mass storage device (disk, tape or both) _____

if printer, specify brand/model _____

anticipated date of acquisition _____

5. Have you ever connected a terminal or a microcomputer in your home to a large computer via dial-up telephone modem?

_____ no

_____ yes, specify brand/model _____

location of large computer _____

printing capabilities _____

6. Are you currently a home subscriber to a commercial computerized information service?

_____ no

_____ yes, specify company/companies _____

7. Do you have access to a microcomputer for educational purposes in your school?

_____ no

_____ yes, specify brand/model _____

RAM memory capacity in kilobytes _____

mass storage device (disk, tape or both) _____

if printer, specify brand/model _____

8. Do you have access for educational purposes to a large computer in your school?

_____ no

_____ yes, specify brand/model _____

9. If you have no computer in your home or in your school to use for educational purposes, what would you do if you wished to enroll in an independent study course which required work on a computer (no printer required) as a portion of each lesson? Check the ONE you would most likely try:

_____ Find a computer to use (at a friend's house, at school, at a church, etc.)

_____ Rent a computer for the use in the course

_____ Purchase a computer for use in the course and as an investment for the future

_____ Decide not to enroll in the course

Comments: _____

_____

_____

_____

-continued on reverse side-

10. Which ONE of the following statements most closely reflects your opinion?

Check ONE:

_____ Independent study courses should be entirely computerized (all reading material, written assignments and exams completed on the computer).

_____ Independent study courses should use the computer to present reading assignments (instead of textbooks and a printed study guide), but exams and written assignments should be completed with paper and pencil in the traditional manner.

_____ Independent study courses should continue to rely exclusively on textbooks and a printed study guide for presentation of course materials, but students should complete written assignments and exams on the computer.

_____ Independent study courses should rely heavily on printed textbooks and study guides, but interactive drills, simulations and/or problem-solving experiences should be provided in a computer "lesson".

_____ Independent study courses should use computer lessons on an optional basis only, and additional textbook or study guide assignments can be given to students who do not wish to use the computer.

_____ Independent study courses should not rely on computer lessons, but appropriate computer lessons should be made available to interested students for purposes of enrichment (for a small additional charge).

_____ Independent study courses should not use computer-assisted instruction.

11. If you feel computer-assisted instruction has a place in independent study courses, which configuration would you prefer? Please rank:

1 = most preferred

5 = least preferred

_____ Students use computer terminals (at specified locations within the IU system) which are connected to centralized large computers.

_____ Students use terminals in schools or homes with access via telephone modem to lessons located on a centralized large computer.

_____ Students use a microcomputer in schools or homes, but dial up the large computer only long enough to download instructional lessons into their microcomputers.

_____ Computer lessons are provided to students on disks for use in a microcomputer in homes or schools.

_____ Students subscribe to a commerical computerized information service and use terminals in their homes to work through independent study courses.

12. Assessment of Independent Study:

In your opinion, how do independent study courses compare with classes taught in your school? Please circle the appropriate number on the following scale:

effective				ineffective
1	2	3	4	5
challenging				easy
1	2	3	4	5
high quality				low quality
1	2	3	4	5

-continued on reverse side-

13. Personal Data

a. In which Independent Study course(s) did you enroll?

_____

b. Did you complete the course(s)? _____

c. In what month & year did you enroll? _____

d. State of residence when enrolled: _____

e. Population of the city/town in which you lived when enrolled (check ONE):

_____ under 1000	_____ 25,000-50,000
_____ 1000-5000	_____ 50,000-100,000
_____ 5000-10,000	_____ 100,000-500,000
_____ 10,000-25,000	_____ over 500,000

f. Which ONE of the following best describes your living situation at the time you were enrolled in Independent Study?

_____ urban _____ suburban _____ small town _____ rural

g. Why did you enroll in Independent Study? (check as many as apply)

_____ course not offered in my school

_____ scheduling conflict at school

_____ to qualify for early graduation

_____ to make up course failed in school

_____ illness or pregnancy

_____ general interest

_____ other, please specify: _____

h. Your current age: _____

14. On a separate sheet of paper, please include comments on any aspect of computer-assisted instruction and its use in independent study courses which may not have been adequately covered in this questionnaire.

END OF QUESTIONNAIRE. THANK YOU FOR YOUR INPUT.